**WHAT IS CLAIMED:**

1. A composition comprising a C-based diazeniumdiolate compound attached to at least one phenyl-containing polymer, wherein said polymer comprises a polymer backbone and said phenyl is either pendant from the backbone of said polymer or part of the backbone of said polymer, and wherein said compound is not an imidate or a thioimidate.

2. A composition comprising a carbon-based diazeniumdiolate compound attached to a phenyl-containing polymer, wherein said composition releases NO under physiological conditions in predictable quantities, wherein said compound does not generate nitrosamines under physiologic conditions.

3. A composition comprising a C-based diazeniumdiolate compound attached to at least one phenyl-containing polymer, and having the formula:

$$R^3\text{-}C(R^1)_x(N_2O_2R^2)_y$$

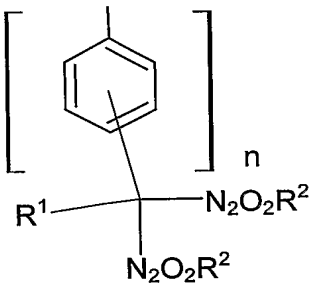
wherein x is an integer from 0 to 2 and y is an integer from 1 to 3, and the sum of x plus y equals 3;

wherein $R^1$ is not an imidate or thioimidate;

wherein $R^2$ is selected from the group consisting of a countercation and a protecting group on the terminal oxygen; and

wherein $R^3$ is a phenyl of said phenyl-containing polymer.

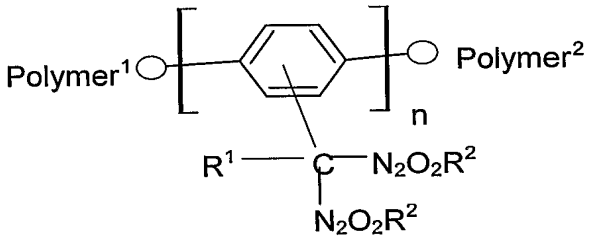
4. A composition comprising a C-based diazeniumdiolate compound attached to at least one phenyl-containing polymer that comprises a polymer backbone, wherein the phenyl of said phenyl-containing polymer is pendant from the backbone of said polymer, and wherein said composition has the following general formula:




wherein $R^1$ not an imidate or thioimidate; and

wherein $R^2$ is selected from the group consisting of a countercation and a protecting group on the terminal oxygen.

5. A composition comprising a C-based diazeniumdiolate compound attached to at least one phenyl-containing polymer that comprises a polymer backbone, wherein the phenyl of said phenyl-containing polymer is part of said polymer backbone, and wherein said composition has the following general formula:




wherein $R^1$ not an imidate or thioimidate;

wherein $R^2$ is selected from the group consisting of a countercation and a protecting group on the terminal oxygen; and

wherein $Polymer^1$ and $Polymer^2$ can be the same or different.

6. The composition of claim 2 or claim 3, wherein said phenyl is either pendant from the backbone of said polymer or part of the backbone of said polymer.
7. The composition of claim 1, claim 2, or claim 3, wherein said phenyl is pendant from the backbone of said polymer.
8. The composition of claim 4 or claim 7, wherein the phenyl is a substituted phenyl.

9. The composition of claim 8, wherein the phenyl is substituted with one or more moieties selected from the group consisting of aliphatic, aromatic, and non-aromatic cyclic groups.
10. The composition of claim 8, wherein the phenyl is substituted with one or more moieties selected from the group consisting of mono- or di-substituted amino, unsubstituted amino, ammonium, alkoxy, acetoxy, aryloxy, acetamide, aldehyde, benzyl, cyano, nitro, thio, sulfonic, vinyl, carboxyl, nitroso, trihalosilane, trialkylsilane, trialkylsiloxane, trialkoxysilane, diazeniumdiolate, hydroxyl, halogen, trihalomethyl, ketone, benzyl, and alkylthio.
11. The composition of claim 4 or claim 7, wherein the phenyl is incorporated in a multi-ring system.
12. The composition of claim 11, wherein the multi-ring system is selected from the group consisting of acridine, anthracene, benzazapine, benzodioxepin, benzothiadiazapine, carbazole, cinnoline, fluorescein, isoquinoline, naphthalene, phenanthrene, phenanthradine, phenazine, phthalazine, quinoline, and quinoxaline.
13. The composition of any one of claims 3 through 5, wherein $R^1$ is selected from the group consisting of an electron withdrawing group, a cyano group, an ether, a thioether, and a non-enamine amine.
14. The composition of claim 13, wherein the ether is selected from the group consisting of $-OCH_3$, $-OC_2H_5$, and $-OSi(CH_3)_3$.
15. The composition of claim 13, wherein the thioether is selected from the group consisting of $-SC_2H_5$, a substituted –SPh, and an unsubstituted –SPh.
16. The composition of claim 13, wherein the amine is a tertiary amine.
17. The composition of claim 13, wherein the amine is $-N(C_2H_5)_2$.
18. The composition of any one of claims 3 through 5, wherein $R^2$ is a countercation selected from the group consisting of alkali metals, group IIa metals, transition metals, and group Ib elements.
19. The composition of any one of claims 3 through 5, wherein $R^2$ is a countercation selected from the group consisting of ammonium and other quaternary amines.

20. The composition of any one of claims 3 through 5, wherein $R^2$ is a protecting group selected from the group consisting of aryl, sulfonyl, glycosyl, acyl, alkyl and olefinic groups.
21. The composition of claim 20, wherein said aryl group is 2,4-dinitrophenyl.
22. The composition of claim 20, wherein said alkyl group is selected from the group consisting of saturated alkyl, unsaturated alkyl, and functionalized alkyl.
23. The composition of claim 22, wherein said functionalized alkyl is selected from the group consisting of 2-bromoethyl, 2-hydroxypropyl, 2-hydroxyethyl and S-acetyl-2-mercaptoethyl.
24. The composition of claim 20, wherein said alkyl group is a vinyl group.
25. The composition of any one of claims 1 through 5, wherein said polymer is selected from the group consisting of polyalkylates, polyarylates, polyamides, polyesters, polycarbonates, polyetherimides, polyimides, polyketones, styrene resins, and copolymers and combinations thereof.
26. The composition of claim 25, wherein said styrene resin is selected from the group consisting of acrylonitrile butadiene styrene terpolymer, acrylonitrile-chlorinated polyethylene-styrene terpolymer, acrylic styrene acrylonitrile terpolymer, styrene acrylonitrile copolymers, olefin modified styrene acrylonitrile copolymers, and styrene butadiene copolymers.
27. The composition of claim 25, wherein said polyamide polymer is selected from the group consisting of polyacrylamide, poly[4,4'-methylenebis(phenyl isocyanate)-alt-1,4-butanediol/di(propylene glycol)/polycaprolactone], poly[4,4'-methylenebis(phenyl isocyanate)-alt-1,4-butanediol/poly(butylene adipate)], poly[4,4'-methylenebis(phenyl isocyanate)-alt-1,4-butanediol/poly(ethylene glycol-co-propylene glycol)/polycaprolactone], poly[4,4'-methylenebis(phenyl isocyanate)-alt-1,4-butanediol/polytetrahydrofuran], terephthalic acid and isophthalic acid derivatives of aromatic polyamides, poly(imino-1,4-phenyleneiminocarbonyl-1,4-phenylenecarbonyl), poly(m-phenylene isophthalamide), poly(p-benzamide), poly(trimethylhexamethylene terephthalatamide), poly-m-xylyene adipamide, poly(meta-phenylene isophthalamide), and copolymers and combinations thereof.

28. The composition of any one of claims 1 through 5, wherein said polymer is selected from the group consisting of polystyrene, poly(α-methylstyrene), poly(4-methylstyrene), polyvinyltoluene, polyvinyl stearate, polyvinylpyrrolidone, poly(4-vinylpyridine), poly(4-vinylphenol), poly(1-vinylnaphthalene), poly(2-vinylnaphthalene), poly(vinyl methyl ketone), poly(vinylidene fluoride), poly(vinylbenzyl chloride), polyvinyl alcohol, poly(vinyl acetate), poly(4-vinylbiphenyl), poly(9-vinylcarbazole), poly(2-vinylpyridine), poly(4-vinylpyridine), polybutadiene, polybutene, poly(butyl acrylate), poly(1,4-butylene adipate), poly(1,4-butylene terephthalate), poly(ethylene terephthalate), poly(ethylene succinate), poly(butyl methacrylate), poly(ethylene oxide), polychloroprene, polyethylene, polytetrafluoroethylene, polyvinylchloride, polypropylene, polydimethylsiloxane, polyacrylonitrile, polyaniline, polysulfone, polyethylene glycol, polypropylene glycol, polyacrylic acid, polyallylamine, poly(benzyl methacrylate), derivatized polyolefins such as polyethylenimine, poly(ethyl methacrylate), polyisobutylene, poly(isobutyl methacrylate), polyisoprene, poly(DL-lactide), poly(methyl methacrylate), polypyrrole, poly(carbonate urethane), poly[di(ethylene glycol) adipate], polyepichlorohydrin, phenolic resins (novolacs and resoles), poly(ethyl acrylate), and combinations thereof including grafts and copolymerizations.
29. The composition of any one of claims 1 through 5, wherein said polymer is selected from the group consisting of silanes and siloxanes.
30. The composition of claim 29, wherein said siloxane is derived from an alkoxysilane or trihalosilane.
31. The composition of any one of claims 1 through 5, wherein said polymer is a biodegradable polymer.
32. The composition of claim 31, wherein said biodegradable polymer is selected from the group consisting of polylactic acid, polyglycolic acid, poly(ε-caprolactone), copolymers thereof and combinations thereof.
33. The composition of claim 5, wherein $Polymer^1$ and $Polymer^2$ are independently selected from the group consisting of polybutylene

terephthalate, polytrimethylene terephthalate, and polycyclohexylenedimethylene terephthalate.

34. The composition of claim 5, wherein one or both of $Polymer^1$ and $Polymer^2$ is an aramide.
35. The composition of claim 34, wherein said aramide is selected from the group consisting of poly(p-phenylene terephthalamide) and poly(m-phenylene isophthalamide).
36. The composition of claim 5, wherein $Polymer^1$ and $Polymer^2$ are polyethylene terephthalate.

37. A system for localized release of nitric oxide to a target site, the system comprising:

a phenyl-containing polymer;

a carbon-based diazeniumdiolate nitric oxide donor molecule that is not an imidate or thioimidate; and

means for covalently linking the nitric oxide donor molecule to the polymer to produce a carbon-based diazeniumdiolate moiety;

whereby decomposition of the carbon-based diazeniumdiolate moiety to produce nitric oxide occurs under physiological conditions and does not produce a nitrosamine from the donor molecule.

38. A method for delivering bacteriostatic or bacteriocidal quantities of NO to a mammalian tissue comprising exposing said tissue to a nitric oxide-releasing polymeric composition.

39. A method of delivering nitric oxide to a perfused organ, the method comprising:

contacting a quantity of perfusate with a nitric oxide-releasing polymeric composition within a perfusion system being used to perfuse the organ; and

releasing sufficient quantities of nitric oxide from said nitric oxide-releasing polymeric composition into the perfusate to affect the biochemistry and/or physiology of the perfused organ.

40. The method of claim 38 or claim 39, wherein said nitric oxide-releasing polymeric composition is the composition of any one of claims 1 through 36.

41. A method of reducing or eliminating a pathogen in stored human platelets comprising including sufficient quantities of a nitric oxide-releasing polymeric composition in a platelet storage container such that bacteriostatic and/or bacteriocidal levels of nitric oxide are delivered to the platelets by release of the nitric oxide from the polymeric composition.

42. A method for storing blood platelets that prevents platelet activation in a platelet suspension, comprising including sufficient quantities of a nitric oxide-releasing polymeric composition in a container used for storing a platelet suspension, wherein contact between the platelet suspension and the polymeric composition produces sufficient nitric oxide to inhibit platelet activation.

43. A method for preventing activation of platelet suspensions comprising including sufficient quantities of a nitric oxide-releasing polymeric composition in a container used to contain a platelet suspension, wherein contact between the platelet suspension and the polymeric composition produces sufficient nitric oxide to inhibit platelet activation.

44. The method of any one of claims 41 through 43, wherein said inclusion step is achieved by using a container comprising said polymeric composition, or by adding the polymeric composition to the container before during or after the platelets are introduced to the container.

45. The method of any one of claims 41 through 43, wherein said nitric oxide-releasing polymeric composition is the composition of any one of claims 1 through 36.

46. The method of any one of claims 41 through 43, wherein said polymeric composition is a blend of nitric oxide-releasing polymeric compositions.

47. A method of treating an animal comprising introducing an effective amount of an acceptable pharmaceutical carrier and a nitric-oxide releasing polymeric composition to release a therapeutically effective amount of nitric oxide to the animal.

48. The method of claim 47, wherein said nitric oxide-releasing polymeric composition is the composition of any one of claims 1 through 36.

49. A medical device coating comprising a nitric oxide-releasing polymer, wherein said nitric oxide-releasing polymer is the composition of any one of claims 1 through 36.

50. The medical device coating of claim 49, wherein said nitric oxide-releasing polymer is the composition of claim 29 or claim 30.

51. The medical device coating of claim 49, wherein said medical device is selected from the group consisting of vascular stents, vascular grafts, catheters, wound dressings, bandages, blood collection bags, blood component storage bags, extracorporeal membrane oxygenation (ECMO) circuits, internal monitoring devices, external monitoring devices, and a device that comes in contact with mammalian tissue *in vivo, in vitro,* or *ex vivo*.

52. A medical device, wherein all or part of the device comprises a nitric oxide-releasing polymer of any one of claims 1 through 36.